

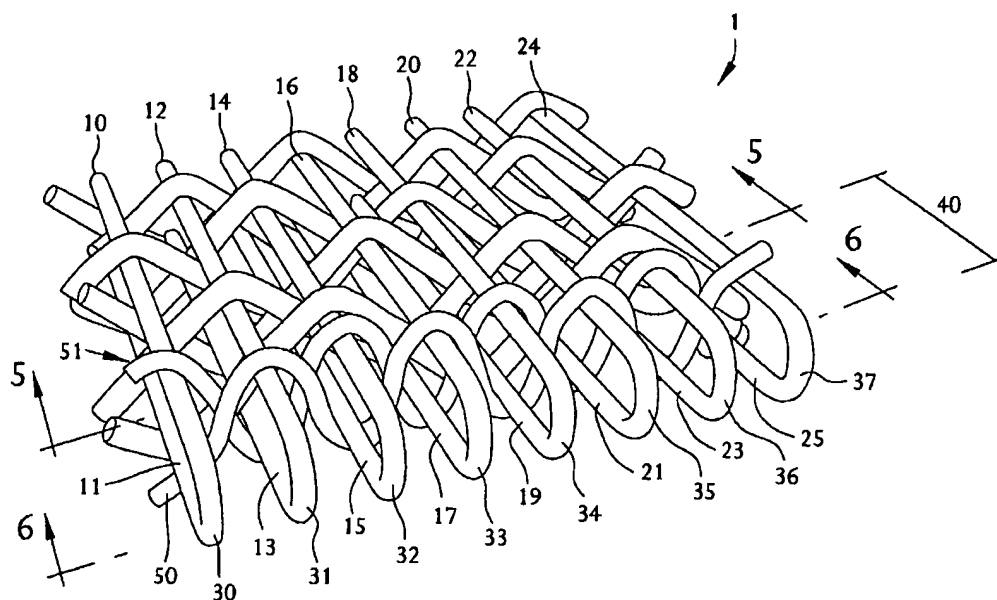
(72) LEE, Henry J., US

(71) ASTEN, INC., US

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(54) **TISSU A BOUCLES DE COUTURE OFFRANT UNE
AMELIORATION DE L'ALIGNEMENT DES BOUCLES
(54) WOVEN LOOP SEAM FABRIC WITH IMPROVED LOOP
ALIGNMENT**



(57) Cette invention permet d'obtenir un tissu de machine à papier à extrémité ouverte dans lequel les première et deuxième couches des fils sens machine sont entrelacés à un certain nombre de fils en sens travers. D'autres fils en sens travers sont entrelacés à la fois à des couches en sens machine se trouvant à chaque extrémité du tissu entre les derniers fils en sens travers et aux boucles de couture. Cela forme une armure d'équilibrage dans laquelle les boucles de couture sont alignées verticalement et horizontalement.

(57) The present invention provides an open ended papermaker's fabric having first and second layers of machine direction (MD) yarns interwoven with a plurality of cross machine direction (CMD) yarns. Additional CMD yarns are interwoven with both MD layers at each end of the fabric between the last CMD yarn and the seam loops in a balancing weave that establishes vertical and horizontal alignment for the seam loops.

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WOVEN LOOP SEAM FABRIC WITH IMPROVED LOOP ALIGNMENT

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention generally relates to a woven
5 fabric which is rendered endless by interdigitating a plurality of loops which are on the two ends of the fabric.

Description of the Prior Art

As will be known to those skilled in the art, papermaking machines generally include three sections which
10 generally are referred to as the formation, press and dryer sections. Papermaking fabrics are used to transport the paper product through the various sections of the papermaking equipment. Many papermaking fabrics are woven fabrics comprising a system of warp yarns interwoven with a
15 system of weft yarns.

The woven fabric may be woven as an endless loop and utilized as such so there is no seam. Alternatively, the fabric may be woven to have two ends which are joined at a seam to form the endless loop. Various seams are known in
20 the art, including pin type seams which utilize a joining wire or pintle which is inserted through seam loops at each end of the fabric to render it endless.

One technique of forming a fabric having seam loops is to provide an endless weave wherein loops are formed by
25 weaving stacked weft yarns around a forming wire. U.S. Patent No. 3,815,645 provides an example of such a weaving technique. A common problem associated with this type of

loop formation is non-uniform loop alignment, both in the vertical and horizontal axis, when the forming wire is removed. This misalignment creates seaming loops that are difficult to intermesh on the papermaking machine.

5 **Figures 1-3** show representative loop misalignments experienced in common prior art endless woven seams. Generally, as a loom weaves the loops in an endless weave, it naturally offsets the returning weft position slightly from its outgoing weft position. Therefore, it is necessary
10 to maintain the weft yarns in a stacked relationship throughout the fabric through the balanced weave of the warp yarns. The last warp yarn 2, however, is generally not balanced by adjacent yarns on each side and therefore, an unbalanced crimp force is applied to the weft yarns in the
15 loop area, as shown by the arrows in **Figure 2**. As a result, the two weft yarn passes which form each loop are not balanced by warps and the loops tend to be misaligned.

A similar misalignment of the loops occurs in flat woven fabrics wherein the tie back portion of the warp yarn
20 is offset from the outgoing portion of the warp yarn during loop formation.

In the present invention, additional cross machine direction (CMD) end yarns are woven in a balanced weave to reduce the unbalanced crimp force acting on each of the seam
25 loops. Thus, the loops are held in better horizontal and vertical alignment.

SUMMARY OF THE INVENTION

The present invention provides an open ended papermaker's fabric having first and second layers of machine direction (MD) yarns interwoven with a plurality of cross machine direction (CMD) yarns in a first weave pattern that forms a plurality of seam loops at each end of the fabric. At least one additional CMD yarn is interwoven with both MD layers at each end of the fabric between the last CMD yarn and the seam loops in a second, balancing weave that establishes vertical and horizontal alignment for the seam loops.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a top plan view of prior art end loops.

Figure 2 is an elevation view of the prior art end loops along the line 2-2 in **Figure 1**.

Figure 3 is a side elevation view of the prior art end loops along the line 3-3 in **Figure 1**.

Figure 4 is a perspective view of a portion of the fabric according to the present invention.

Figure 5 is a section view of the fabric along the line 5-5 in **Figure 4**.

Figure 6 is a section view of the fabric along the line 6-6 in **Figure 4**.

Figure 7 is a weave pattern diagram of the fabric of **Figures 4-6**.

Figure 8 is a top plan view of a portion of one end of the fabric.

Figure 9 is a front elevation of a portion of one end of the fabric.

Figure 10 is a side elevation of a portion of one end of the fabric.

5 **Figure 11** is a top plan view of a portion of both ends of the fabric seamed together.

Figure 12 is an elevation view showing the weave pattern of the balancing yarns of an alternate embodiment.

Figure 13 is an elevation view showing the weave
10 pattern of an alternate embodiment of the invention.

Figure 14 is a top view of two ends of the fabric of **Figure 13** seamed together.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments will be described with
15 reference to the drawing figures where like numerals represent like elements throughout.

Referring to **Figure 4**, a portion of a papermaking fabric 1 made in accordance with the present invention is shown. The papermaking fabric 1 comprises a MD top layer 10
20 and a MD bottom layer 11. CMD yarns 2-5 are interwoven with the top and bottom yarn layers 10, 11 which are joined at each end of the fabric 1 by seam loops 30-37, respectively. The seam loop zone 40 is formed at each end of the fabric 1. In the preferred endless woven embodiment, the CMD yarns 2-5
25 are warp yarns woven in a repeat pattern that passes over, between, under, between the two layers of MD or weft yarns 10, 11, as shown in **Figure 5**.

As explained above, the last CMD yarn 2 generally causes non-uniform, unbalanced forces on the seam loops 30-37. To reduce the unbalanced forces, two additional CMD yarns 50, 51 are woven with both layers of MD yarns 10, 11 in each seam loop zone 40 in a balancing weave. In the preferred embodiment, the additional CMD yarns 50, 51 are woven in a single repeat of plain weave.

As shown in **Figure 7**, in such a plain weave, additional CMD yarn 50 weaves over and under the two MD layers 10, 11 in a given repeat while additional CMD yarn 51 weaves under and over the MD yarn layers 10, 11 of the same repeat. As a result, the crimp force of the additional CMD yarns 50 and 51 counter balance the crimp force of the fabric body CMD yarns 2-5 on the loops 30-37 across the width of the fabric 1. Consequently, the seam loops 30-37 are held in better vertical and horizontal alignment as shown in **Figures 8-10**. This allows for more efficient interdigitating of the loops 30-37 and easier insertion of the pintle 100, as shown in **Figure 11**.

An alternate balancing weave pattern for the additional CMD yarns 50, 51 is shown in **Figure 12**. The additional CMD yarns 50, 51 weave in opposing "N" weaves wherein additional CMD yarn 50 weaves over, between, under and between the two MD layers in a given repeat, while additional CMD yarn 51 weaves under, between, over and between the same MD yarns. As shown by the arrows in **Figure 12**, the resulting crimp forces of the additional yarns 50, 51 balance the weave and

thereby provide greater balance to the MD yarns and the loops formed thereby.

If desired, batting material 110 may be attached to one or both sides of the fabric 1. In such event, the additional CMD yarns 50, 51 furnish an additional benefit of providing additional anchoring points for the batt material 110 in the seam loop zone 40. In both of the above embodiments, the additional CMD yarns 50, 51 are preferably multifilament yarns which tend to be more receptive to needling and provide greater batt anchorage in the seam loop zone 40.

In applications where the batt material 110 is anchored in a different manner or batt anchorage is less crucial, it may be beneficial to use an additional yarn which has the same characteristics of the last CMD yarn 102. In such an embodiment, only one additional yarn 150, as shown in Figures 13-14, may be required since it is able to apply counter balancing forces to the last CMD yarn 102 directly. The additional CMD yarn 150 is woven in a repeat which is inverse to that of the last CMD yarn 102. That is, if the last CMD yarn 102 weaves over, between, under and between pairs of MD yarns in a given repeat, the additional CMD yarn 150 weaves under, between, over and between in the same repeat. As a result, the additional CMD yarn 150 counter balances the crimp forces of the last CMD yarn 102, as shown in Figure 13.

While the present invention has been described in terms of the preferred embodiments, other variations which are

within the scope of the invention as outlined in the claims
will be apparent to those skilled in the art.

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I claim:

1. An open ended papermaker's fabric of a type having a MD yarn system and a CMD yarn system wherein a plurality of seam loops are formed at each end of the fabric by yarns
5 from the MD yarn system, the ends thereof are characterized by:

at least one additional CMD yarn interwoven with the MD yarn system in a repeat pattern that passes from one side of the fabric to an opposite side of the fabric and places the
10 seam loops in substantially vertical and horizontal alignment.

2. The fabric according to claim 1 wherein the MD yarn system comprises weft yarns and the CMD yarn system comprises warp yarns.

3. The fabric according to claim 1 wherein the MD yarn systems comprises warp yarns and the CMD yarn system comprises weft yarns.

4. The fabric according to claim 1 wherein two additional CMD yarns are interwoven at each end of the fabric.

5. The fabric according to claim 4 wherein, at each end of the fabric, one of the additional yarns weaves over and under pairs of MD yarns in a given repeat and the other

additional yarn weaves under and over the pairs of the repeat.

6. The fabric according to claim 4 wherein, at each end of the fabric, one of the additional yarns weaves over, between, under and between pairs of MD yarns in a given repeat and the other additional yarn weaves under, between,
5 over and between the pairs of the repeat.

7. The fabric according to claim 1 wherein, at each end of the fabric, the additional yarn weaves in a repeat pattern which is inverse to the weave pattern of a last CMD yarn at the respective end of the fabric.

8. The fabric according to claim 1 wherein batt material is attached to the fabric.

9. The fabric according to claim 1 wherein the additional yarns are multifilament yarns.

10. An open ended papermaker's fabric comprising:
first and second layers of weft yarns interwoven with a plurality of warp yarns in a first weave pattern that forms a plurality of seam loops at each end of the fabric
5 from the weft yarns; and

additional warp yarns interwoven with both weft layers at each end of the fabric between the last warp yarn and the

seam loops in a second, balancing weave that establishes a vertical and horizontal alignment for the seam loops.

11. A method of making a papermaker's fabric comprising the steps of:

5 weaving first and second layers of weft yarns with a plurality of warp yarns in a first weave pattern that forms a plurality of seam loops at each end of the fabric from the weft yarns; and

10 weaving additional warp yarns with both weft layers at each end of the fabric between the last warp yarn and the seam loops in a second, balancing weave that establishes a vertical and horizontal alignment for the seam loops.

12. The method according to claim 11 further comprising the step of attaching batt material to the fabric.

ABSTRACT

The present invention provides an open ended papermaker's fabric having first and second layers of machine direction (MD) yarns interwoven with a plurality of
5 cross machine direction (CMD) yarns. Additional CMD yarns are interwoven with both MD layers at each end of the fabric between the last CMD yarn and the seam loops in a balancing weave that establishes vertical and horizontal alignment for the seam loops.

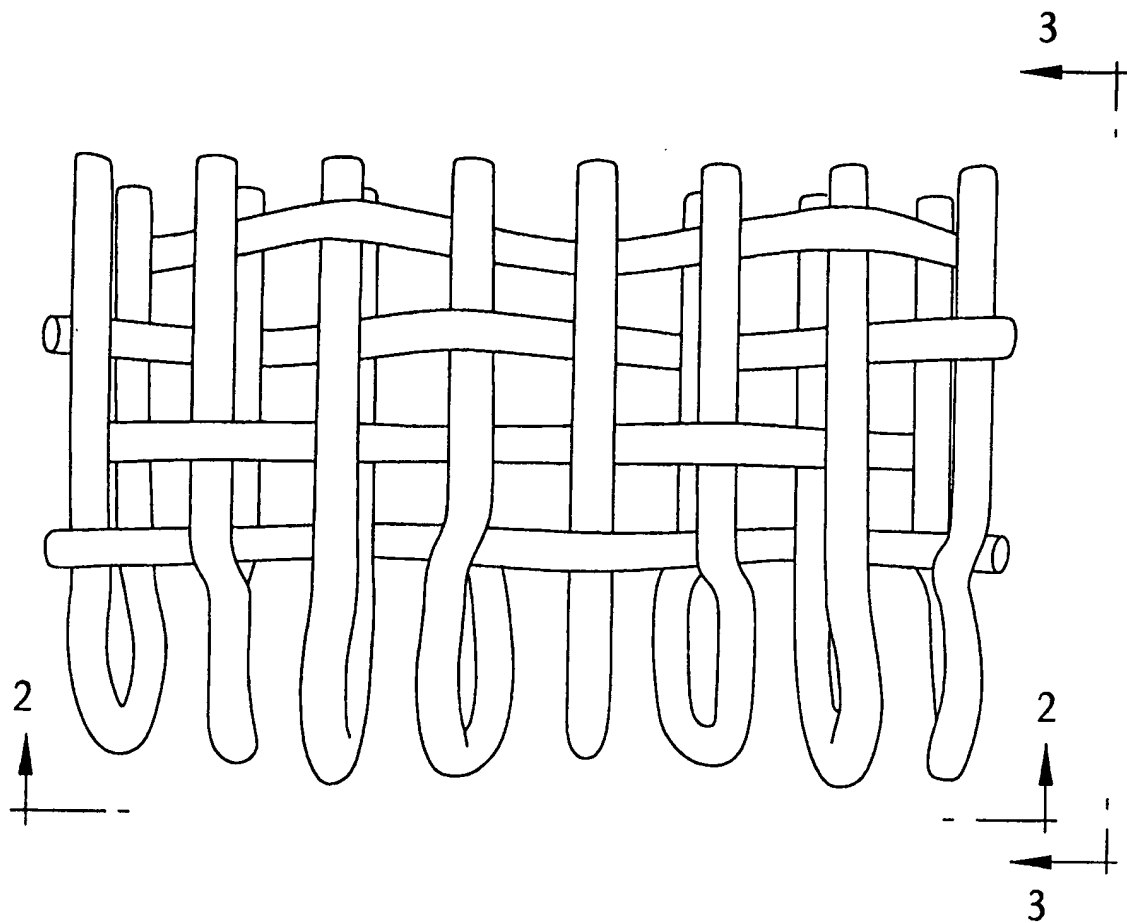


FIG. 1
(PRIOR ART)

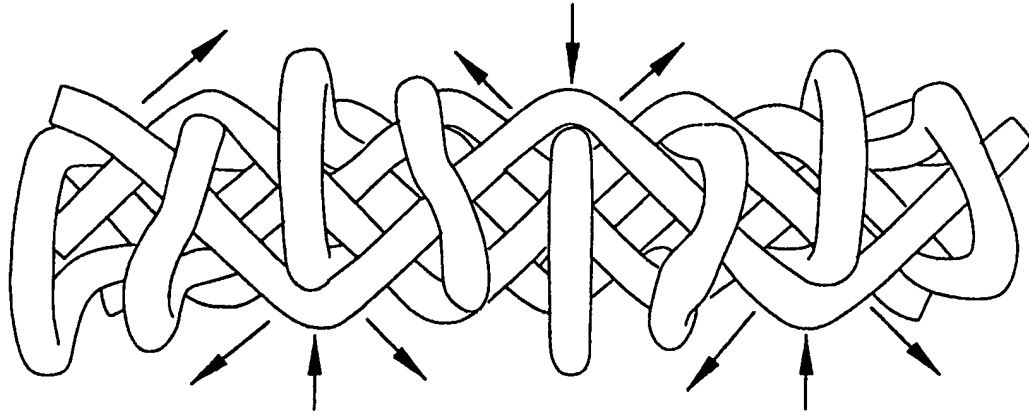


FIG. 2
(PRIOR ART)

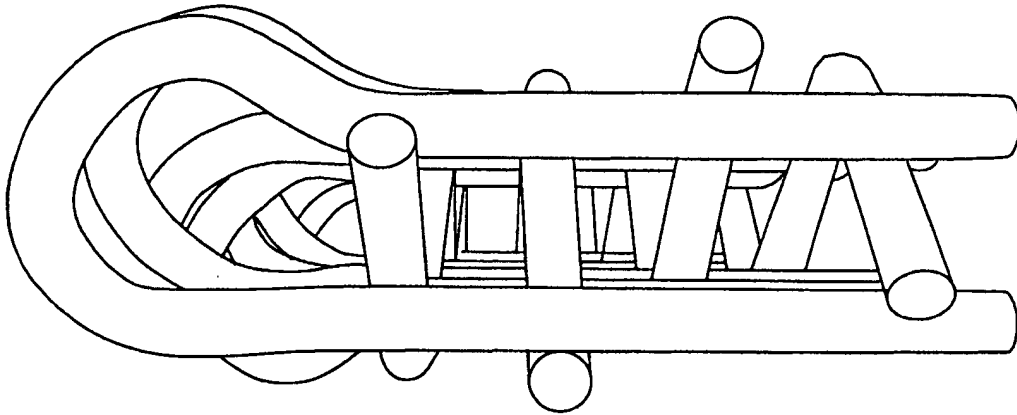


FIG. 3
(PRIOR ART)



FIG. 4

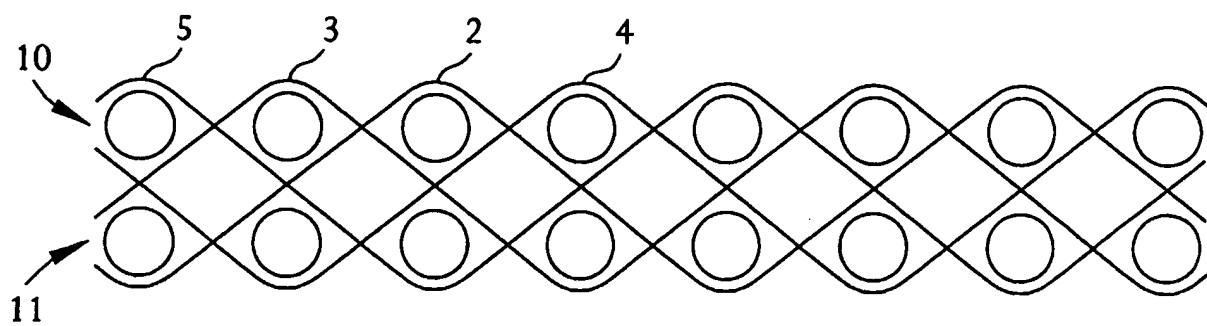


FIG. 5

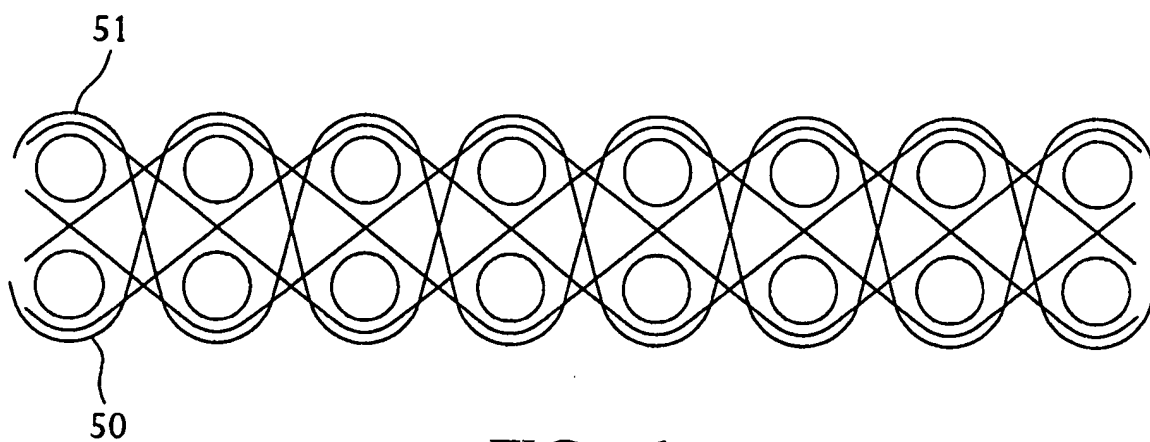


FIG. 6

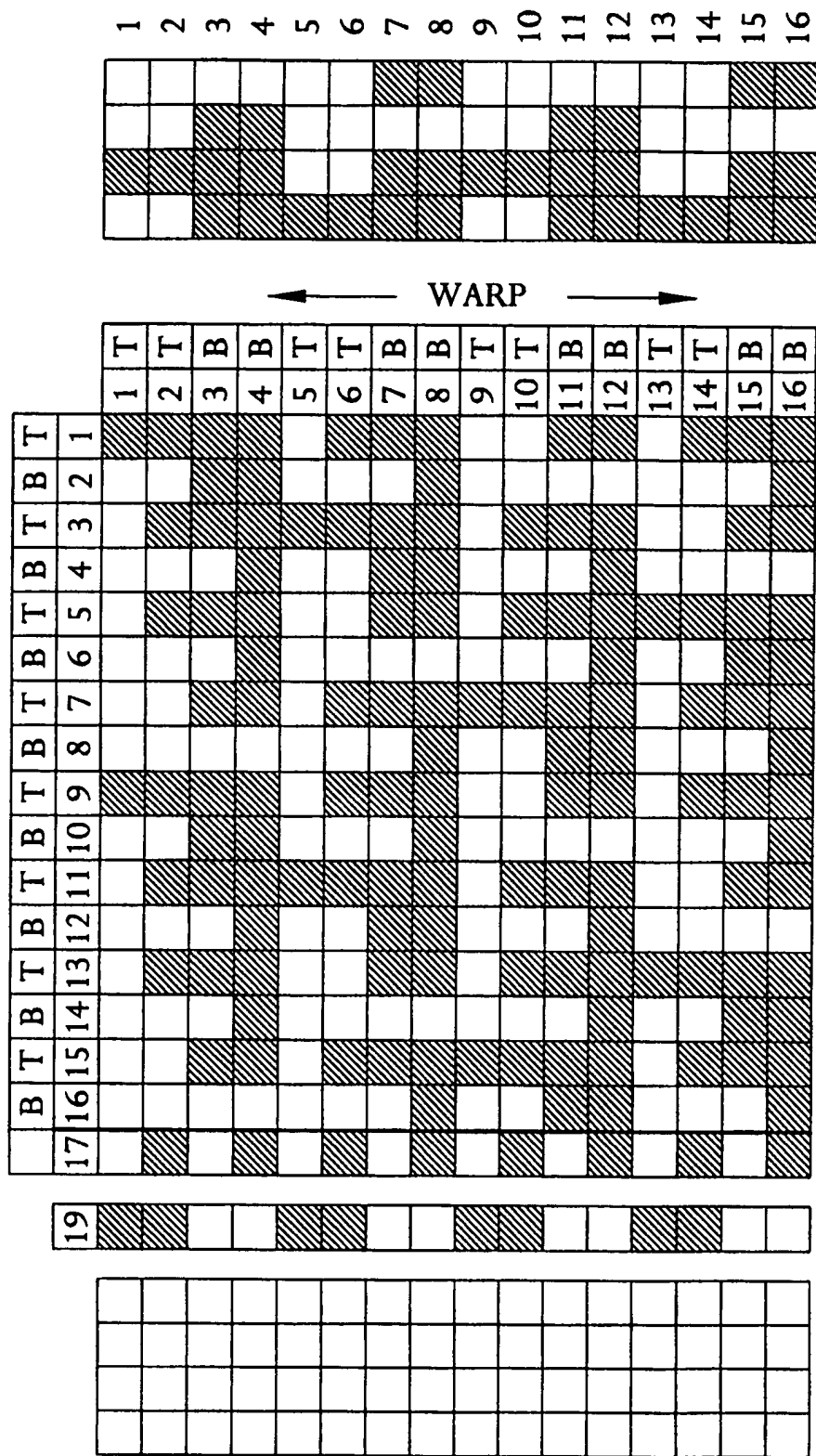


FIG. 7

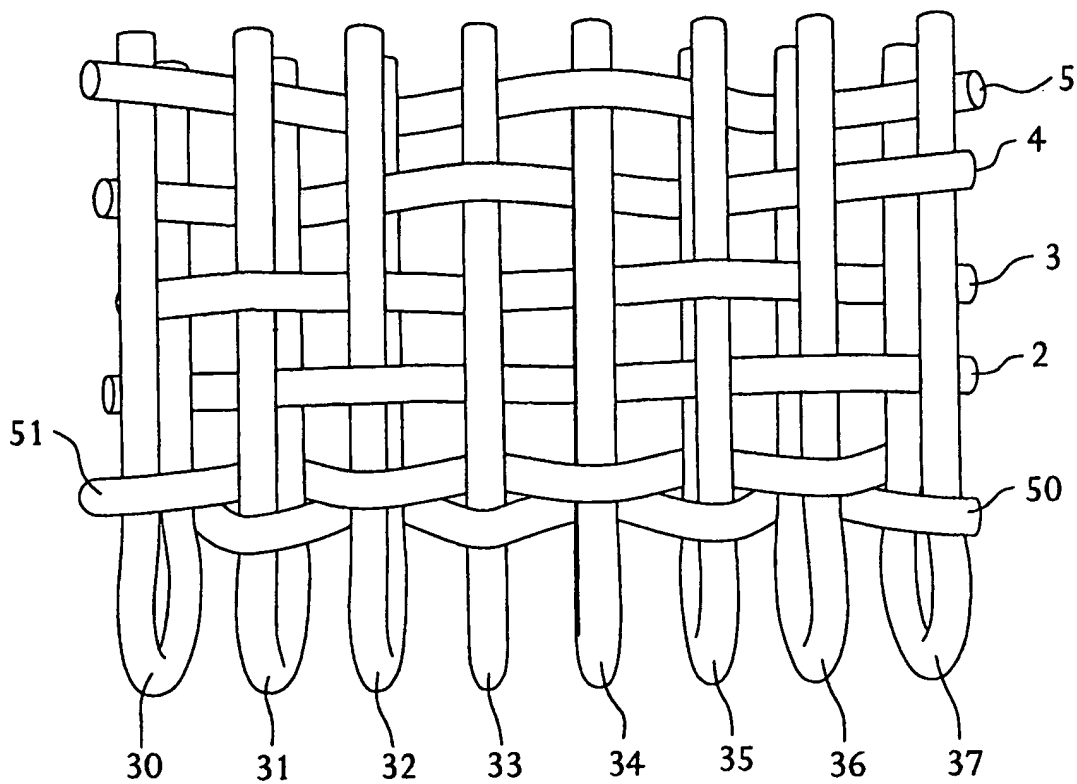


FIG. 8

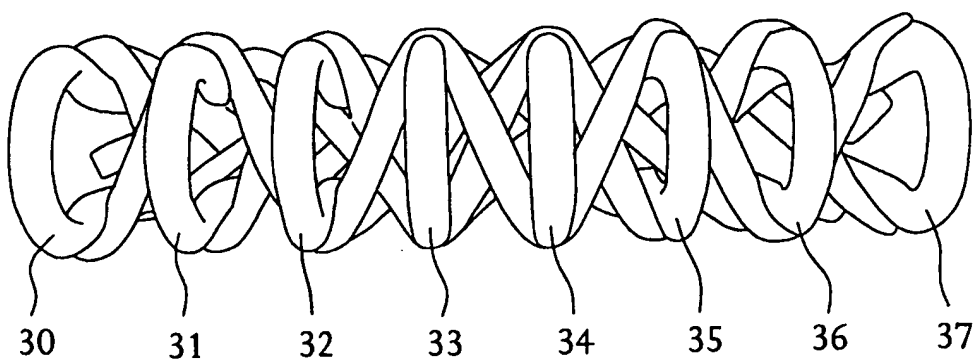


FIG. 9

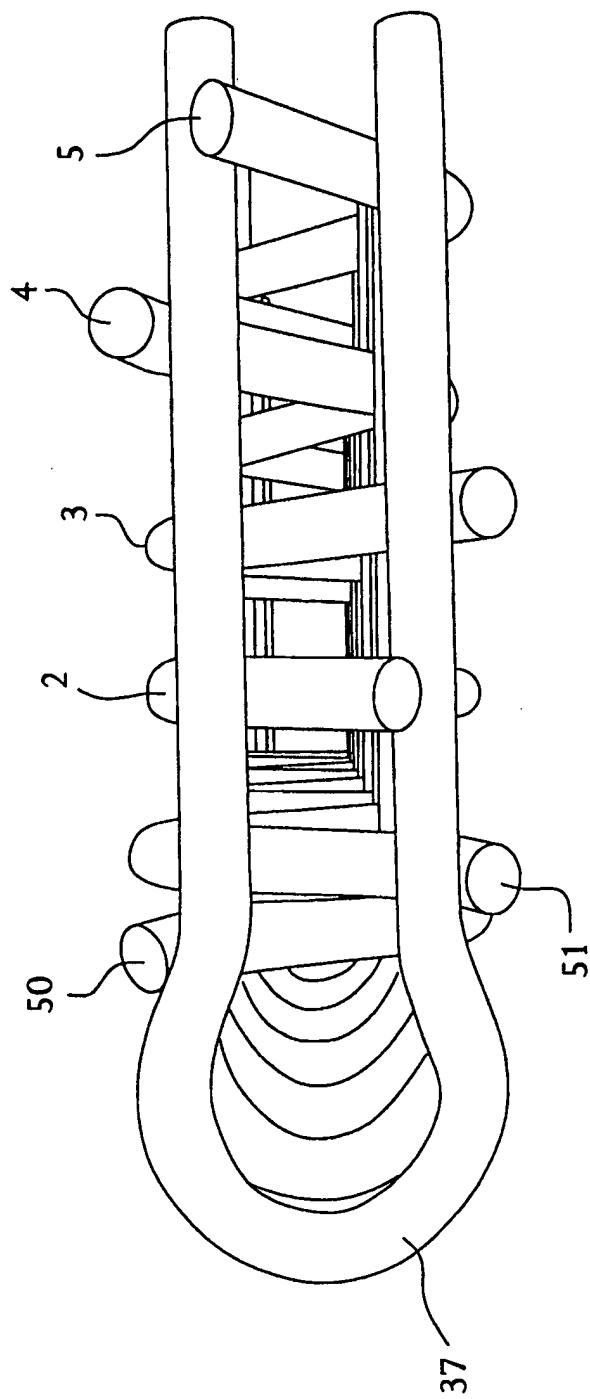


FIG. 10

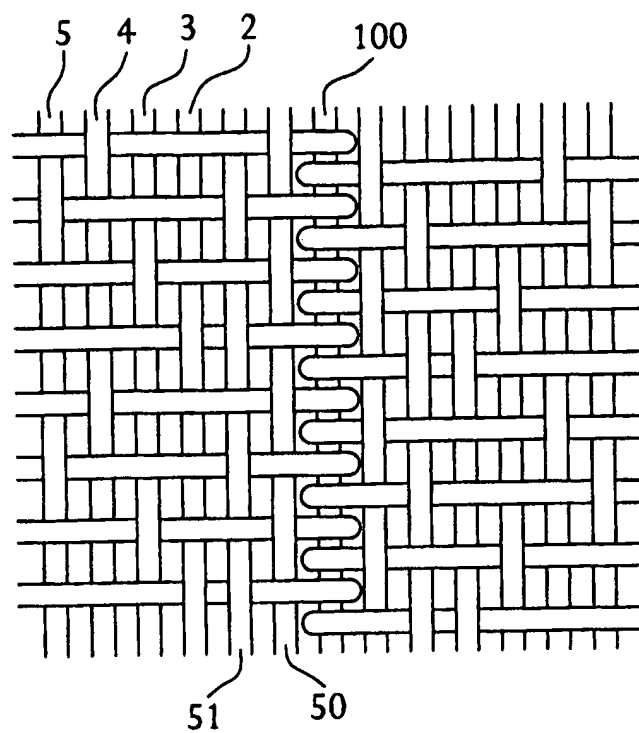


FIG. 11

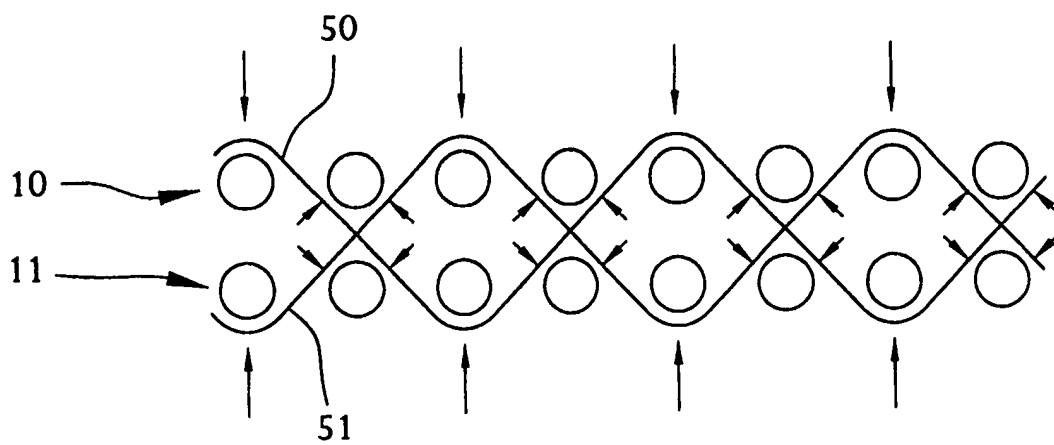


FIG. 12

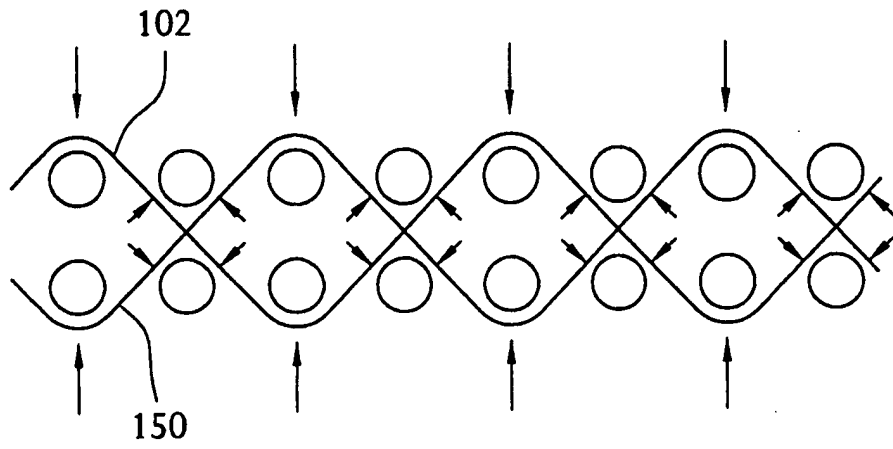


FIG. 13

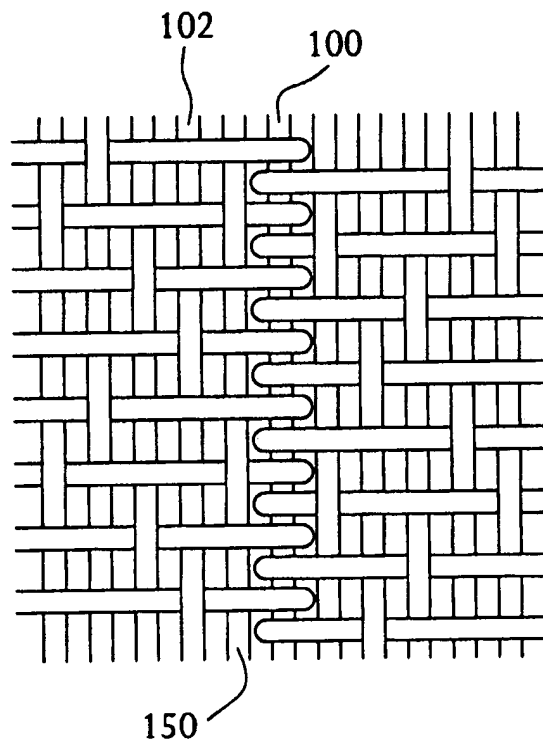


FIG. 14

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